

## **8. RI/BRA SUMMARY AND CONCLUSIONS**

The following sections summarize the nature and extent of contamination and the human health and ecological risk assessments. Sections 1 through 7 of this document form the basis for the conclusions presented.

### **8.1 Contamination Nature and Extent Summary**

Fifty-two potential release sites identified in the FFA/CO were evaluated as part of this BRA. Fourteen of these sites were retained following a contamination nature and extent evaluation and contaminant screening (Section 4) and for quantitative evaluation in the baseline risk assessment (Section 6). The nature and extent of contamination at all sites retained for evaluation in the BRA is based on data collected during the OU 4-13 field investigation and previous WAG 4 investigations.

### **8.2 Human Health Risk Evaluation Summary**

The human health BRA consisted of two broad phases of analysis; 1) site and contaminant screening that identified release sites and COPCs that could produce adverse human health impacts to workers and potential future residents at WAG 4, and; 2) an exposure route analysis and estimates of human health risk for each COPC. The exposure route analysis includes an exposure assessment, a toxicity assessment, and a risk characterization discussion. The BRA includes an evaluation of human health risks associated with exposure to contaminants through soil ingestion, dermal absorption from soil, fugitive dust inhalation, volatile inhalation, external radiation exposure, groundwater ingestion, ingestion of homegrown produce, dermal absorption of groundwater, and inhalation of water vapors due to indoor water use. Potential risks are assessed on a cumulative basis for the air and groundwater exposure pathways (i.e., estimated risks for these pathways are equivalent for each site evaluated in the BRA).

Tables 8-1 through 8-3 summarize the results of the human health risk assessment with respect to the evaluated exposure routes. Table 8-1 indicates which release sites have calculated risks in excess of 1E-04, Table 8-2 indicates which release sites have calculated risks in excess of 1E-06, and Table 8-3 indicates which release sites have calculated hazard indices in excess of 1.

The EPA permissible risk range is 1E-04 to 1E-06 for carcinogens and  $\leq 1.0$  for noncarcinogens. Sites with potential risks that exceed any of these criteria are retained for further evaluation in the Feasibility Study (Sections 9–12). Six of the 14 sites retained for evaluation in the BRA exceed the EPA permissible risk criteria: CFA-04 Pond, CFA-08 Drainfield, CFA-10 Transformer Yard Oil Spills, CFA-12 French Drain; south drain. CFA-13 Dry Well, and CFA-15 Dry Well.

The exposure routes identified as potentially complete for these sites that have calculated risks above the EPA target risk range at WAG 4 (i.e., potential excess cancer risk exceeds 1E-04 to 1E-06; target hazard index exceeds 1.0) are ingestion of soil, dermal contact with soil, external radiation exposure, and ingestion of homegrown produce.

The contaminants that are associated with the greatest potential for adverse human health effects at WAG 4 (i.e., potential excess cancer risk exceeds 1E-04; hazard index exceeds 1.0) are metals and radionuclides. These contaminants are shown in Table 8-4 according to the exposure scenario (i.e., occupational or residential exposure) in which they are predicted to produce unacceptable risks. These contaminants are considered to be COCs for WAG 4.

**Table 8-1.** Summary of sites and exposure routes with calculated risks greater than 1E-04.

Site	Occupational Scenario					Residential Scenario								
	Soil			Air		Soil			Air		Groundwater			
	Ingestion of soil	Dermal absorption of soil	External radiation exposure	Inhalation of fugitive dust	Inhalation of volatiles	Ingestion of soil	Dermal absorption of soil	Ingestion of homegrown produce	External radiation exposure	Inhalation of fugitive dust	Inhalation of volatiles	Ingestion of GW	Dermal absorption of GW	Inhalation of vapors from indoor water use
OU 4-02: CFA-13 Dry Well (South of CFA-640)									●					
OU 4-02: CFA-15 Dry Well (CFA-674)									●					
OU 4-05: CFA-04 Pond (CFA-674)														
CFA-17 Fire Department Training Area, bermed/ CFA-47 Fire Station Chemical Disposal														
OU 4-07: CFA-07 French Drain E/S (CFA-633)														
CFA-12 French Drain (2) (CFA-690) [south drain only]									●					
OU 4-08: CFA-08 Drainfield			⊙						●					
OU 4-08: CFA-08 Sewage Plant (CFA-691)														
OU 4-09: CFA-10 Transformer Yard Oil Spills														
CFA-26 CFA-760 Pump Station Fuel Spill														
CFA-42 Tank Farm Pump Station Spills														
CFA-46 Cafeteria Oil Tank Spill (CFA-721)														
OU 4-11: CFA-05 Motor Pond Pool														
OU 4-13: CFA-52 Diesel Fuel UST (CFA-730) at Building CFA-613 Bunkhouse														
○ = Risk greater than 1E-04 for the current occupational exposure scenario. ⊙ = Risk greater than 1E-04 for the current and future occupational exposure scenario. ● = Risk greater than 1E-04 for the future residential exposure scenario.														

**Table 8-2.** Summary of sites and exposure routes with calculated risks greater than 1E-06.

Site	Occupational Scenario					Residential Scenario								
	Soil			Air		Soil				Air		Groundwater		
	Ingestion of soil	Dermal absorption of soil	External radiation exposure	Inhalation of fugitive dust	Inhalation of volatiles	Ingestion of soil	Dermal absorption of soil	Ingestion of homegrown produce	External radiation exposure	Inhalation of fugitive dust	Inhalation of volatiles	Ingestion of GW	Dermal absorption of GW	Inhalation of vapors from indoor water use
OU 4-02: CFA-13 Dry Well (South of CFA-640)			⊙			●	●	●	●					
OU 4-02: CFA-15 Dry Well (CFA-674)			⊙					●	●					
OU 4-05: CFA-04 Pond (CFA-674)	⊙	⊙	⊙			●	●	●	●					
CFA-17 Fire Department Training Area, bermed/ CFA-47 Fire Station Chemical Disposal														
OU 4-07: CFA-07 French Drain E/S (CFA-633)														
CFA-12 French Drain (2) (CFA-690) [south drain only]						●		●	●					
OU 4-08: CFA-08 Drainfield	○	⊙	⊙				●	●	●					
OU 4-08: CFA-08 Sewage Plant (CFA-691)														
OU 4-09: CFA-10 Transformer Yard Oil Spills		⊙												
CFA-26 CFA-760 Pump Station Fuel Spill														
CFA-42 Tank Farm Pump Station Spills														
CFA-46 Cafeteria Oil Tank Spill (CFA-721)														
OU 4-11: CFA-05 Motor Pond Pool														
OU 4-13: CFA-52 Diesel Fuel UST (CFA-730) at Building CFA-613 Bunkhouse														

○ = Risk greater than 1E-06 for the current occupational exposure scenario.

⊙ = Risk greater than 1E-06 for the current and future occupational exposure scenario.

● = Risk greater than 1E-06 for the future residential exposure scenario.

**Table 8-3.** Summary of sites and exposure routes with calculated hazard indices greater than 1.

Site	Occupational Scenario					Residential Scenario								
	Soil			Air		Soil				Air		Groundwater		
	Ingestion of soil	Dermal absorption of soil	External radiation exposure	Inhalation of fugitive dust	Inhalation of volatiles	Ingestion of soil	Dermal absorption of soil	Ingestion of homegrown produce	External radiation exposure	Inhalation of fugitive dust	Inhalation of volatiles	Ingestion of GW	Dermal absorption of GW	Inhalation of vapors from indoor water use
OU 4-02: CFA-13 Dry Well (South of CFA-640)						●								
OU 4-02: CFA-15 Dry Well (CFA-674)														
OU 4-05: CFA-04 Pond (CFA-674)						●		●						
CFA-17 Fire Department Training Area, bermed/ CFA-47 Fire Station Chemical Disposal														
OU 4-07: CFA-07 French Drain E/S (CFA-633)														
CFA-12 French Drain (2) (CFA-690) [south drain only]														
OU 4-08: CFA-08 Drainfield														
OU 4-08: CFA-08 Sewage Plant (CFA-691)														
OU 4-09: CFA-10 Transformer Yard Oil Spills														
CFA-26 CFA-760 Pump Station Fuel Spill														
CFA-42 Tank Farm Pump Station Spills														
CFA-46 Cafeteria Oil Tank Spill (CFA-721)														
OU 4-11: CFA-05 Motor Pond Pool														
OU 4-13: CFA-52 Diesel Fuel UST (CFA-730) at Building CFA-613 Bunkhouse														
○ = Hazard index greater than 1 for the current occupational exposure scenario. ⊗ = Hazard index greater than 1 for the current and future occupational exposure scenario. ● = Hazard index greater than 1 for the future residential exposure scenario.														

**Table 8-4.** WAG 4 contaminants of concern.

Exposure Scenario	Radionuclides	Metals	Organic Contaminants	Other
Occupational	Cs-137	Lead	None	None
Residential	Cs-137, Ra-226	Mercury	None	None

The cumulative risk assessment for air and groundwater exposure pathways indicates that potential excess cancer or non-cancer risks do not exceed the EPA permissible risk levels for the occupational and residential exposure scenarios.

### 8.3 Ecological Risk Evaluation Summary

The objectives of the OU 4-13 WAG ERA were to define the extent of contamination for each site at the WAG level, determine the potential effects from contaminants on environmental receptors, habitats, or special environments, determine the potential effects from contaminants on other ecological receptors at WAG 4, and identify sites and COPCs to be included in the OU 10-04 ERA. The approach used in the WAG ERA is an extension of the screening level ecological risk assessment methodology used at the INEEL (VanHorn, Hampton, and Morris 1995). This methodology uses conservative exposure modeling and input parameters to identify contaminants and sites that may pose a risk to the environment.

The ecological risk assessment is presented in Section 7. All potential release sites identified in the FFA/CO were evaluated for risk to ecological receptors. The retained sites and their associated COPCs were evaluated as discussed in Section 7, using the general approach proposed by EPA (EPA 1994, 1996). As discussed in Section 7.5, the result of this assessment will be utilized as input into the OU 10-04 ERA.

For the purposes of this assessment, HQs greater than the target values (i.e., 1 for nonradiological contaminants, and 0.1 for radionuclides) are indicative of potential adverse effects. Due to the uncertainty in the ERA methods, HQs are used only as an indicator of risk and should not be interpreted as a final indication of actual adverse effects to ecological receptors. Of the sites and COPCs assessed, 11 sites were eliminated as posing no potential risk to ecological receptors (CFA-12, CFA-23, CFA-24, CFA-27, CFA-28, CFA-29, CFA-30, CFA-34, CFA-37, CFA-38, and CFA-42). The results of the assessment indicate risk to ecological receptors at the remaining 16 sites. Table 8-5 summarizes the results of the ERA evaluation by presenting the range of HQs calculated for functional groups potentially present at each site.

A basic assumption of the ERA is that, under a future use scenario, the contamination is present at an abandoned site, which will not be institutionally controlled. In actuality, co-located facilities are currently in use and institutional controls will remain in place until they are decommissioned, at which time they will be reassessed. Since these sites are at an industrial facility that is currently in use, they most likely do not contain desirable or valuable habitat. The absence of habitat, facility activities, and institutional controls will minimize the exposure of ecological receptors to levels which could be considered acceptable.

Additionally, due to the conservative nature of the ERA, an evaluation of the exposure of ecological receptors to some inorganics at or near background concentrations would also be indicative of risk. Therefore, these sites would not be considered in the remedial alternative screening process. The apparent risk from naturally occurring metals will be evaluated specifically during the WAG 10 OU 10-04 ERA.

**Table 8-5.** Summary of the sites with potential for posing risk to ecological receptors.

Site Number	Site Description and Size (sq. meters)	Contaminant of Potential Concern	Hazard Quotient
CFA-01	Landfill I 4.30E+04	Benzo(a)pyrene	<1 to 2
		Silver	≤1 to 4
CFA-02	Landfill II 7.07E+05	4-methyl-2-pentanone	NA
		Acetone	≤1 to 20
		Benzo(b)fluoranthene	<1 to 1
		Benzo(k)fluoranthene	<1 to 2
		Dibenzofuran	NA
		Lead	≤1 to 700
		Pentachlorophenol	NA
CFA-04	Pond near CFA-674 6.88E+03	Mercury	<1 to 30,000
		Silver	<1 to 6
CFA-05	Motor Pool Pond 7.43E+03	4-methyl-2-pentanone	NA
		Cadmium	≤1 to 10,000
		Copper	≤1 to 100
		Lead	≤1 to 1,000
		Mercury	≤1 to 80
CFA-08	Sewage Plant (CFA-691), Septic Tank (CFA-716), and Drainfield 1.85E+04	Chloromethane	NA
		Mercury	≤1 to 30
		Silver	≤3 to ≤5
CFA-10	Transformer Yard Oil Spills 8.08E+02	Copper	<1 to 70
		Lead	<1 to 3,000
CFA-12	Two French Drains (CFA-690) 1.34E+01	Pentachlorophenol	NA
CFA-13	Dry Well (South of CFA-640)	Copper	≤1 to 20
		Lead	<1 to 33
		Mercury	<1 to 2

**Table 8-5.** (continued).

Site Number	Site Description and Size (sq. meters)	Contaminant of Potential Concern	Hazard Quotient
		Pyrene	<1 to 2
		Silver	4
<b>CFA-17/47</b>	<b>Fire Department Training Area, bermed and Fire Station Chemical Disposal 1.96E+03</b>	<b>Xylene</b>	<b>≤3 to 10</b>
CFA-21	Fuel Tank at Nevada Circle (S by CFA-629) 7.00E+00	TPH	<1 to 3
CFA-26	CFA-760 Pump Station Fuel Spills 1.12E+02	TPH	≤1 to ≤4
CFA-31	Waste Oil Tank at CFA-754 2.52E+01	TPH	<1 to 1
CFA-40	Returnable Drum Storage (south of CFA-601) 5.40E+02	TPH	<1 to 3
<b>CFA-41</b>	<b>Excess Drum Storage (south of CFA-674) 6.97E+03</b>	<b>TPH</b>	<b>&lt;1 to 20</b>
<b>CFA-43</b>	<b>Lead Storage Area 1.53E+04</b>	<b>Lead</b>	<b>≤1 to 70</b>
CFA-51	Dry Well at north end of CFA-640 1.00E-01	Copper	<1 to 1

---

Bold text indicates that site was retained after the HQ <10 screen discussed in Section 8.4.

---

## 8.4 Conclusions

The ERA screening process as presented in Table 8-5 determined that potential risks to ecological receptors exist at 13 sites that have a hazard quotient greater than one. Human health risks exceeding allowable levels exist at three of these sites (CFA-04, -08, and -10) and three other (CFA-12, -13, and -15).

Based on consultation with remedial project managers and agency concurrence, a further screening of the 13 sites posing a potential ecological risk was performed in which contaminants of concern were eliminated if the hazard quotient across receptors was less than 10, as determined by the maximum contaminant concentration, or in cases where sufficient data exists, the 95% UCL. In addition, the sites with calculated risks to human health will be evaluated in terms of the prior remediation performed, the present condition of the site and the realistic opportunities for exposure.

Table 8-5 shows 4 sites eliminated because the HQ is less than 10; sites CFA-21, -26, -40, and -51. In addition, a number of COPCs are eliminated. The remaining sites (CFA-01, -02, -04, -05, -08, -10, -13, -41, and -43) are discussed below.

**Table 8-6.** Summary of WAG 4 release sites with elevated risk levels to human health and ecological receptors.

Operable Unit	Site	Contaminant of Concern	Receptors		Further Evaluation
			Ecological	Human Health	
4-02	CFA-13	Copper	✓		Evaluate in the OU 10-04 RI/FS
		Silver	✓		Evaluate in the OU 10-04 RI/FS
		Lead	✓		Evaluate in the OU 10-04 RI/FS
		Mercury	✓		Evaluate in the OU 10-04 RI/FS
4-04	CFA-41	TPH	✓		Evaluate in the OU 10-04 RI/FS
4-05	CFA-04	Mercury	✓	✓	Evaluate in the FS
4-06	CFA-43	Lead	✓		Evaluate in the OU 10-04 RI/FS
4-08	CFA-08	Cesium-137		✓	Evaluate in the FS
4-09	CFA-10	Lead	✓	✓	Evaluate in the FS
		Copper	✓		Evaluate in the FS
4-12	CFA-05	Arsenic	✓		Evaluate in the OU 10-04 RI/FS
		Chrysene	✓		Evaluate in the OU 10-04 RI/FS
		Silver	✓		Evaluate in the OU 10-04 RI/FS
		Cadmium	✓		Evaluate in the OU 10-04 RI/FS
		Lead	✓		Evaluate in the OU 10-04 RI/FS
		4-methyl-2-pentanone	✓		Evaluate in the OU 10-04 RI/FS
4-12	CFA-02	Lead	✓		Evaluate in the OU 10-04 RI/FS
		4-methyl-2-pentanone	✓		Evaluate in the OU 10-04 RI/FS
		Acetone	✓		Evaluate in the OU 10-04 RI/FS
		Dibenzofuran	✓		Evaluate in the OU 10-04 RI/FS
		Pentachlorophenol	✓		Evaluate in the OU 10-04 RI/FS
		2-methylnaphthalene	✓		Evaluate in the OU 10-04 RI/FS

value of 1 for ecological receptors. Based on consultation with remedial project managers and agency concurrence, a further screening of sites posing potential ecological risk was performed in which contaminants were eliminated as a concern if the maximum HQ across receptors was less than 10. As a result of the screening, ten of the 16 sites retained after the 10-times background screen for metals remain. These sites include, CFA-02, CFA-04, CFA-05, CFA-08, CFA-10, CFA-12, CFA-13, CFA-17/47, CFA-41, and CFA-43. Contaminants that did not meet this criterion were retained and are shown by bold type in Table 8-5.

#### **8.4.1 OU 4-02: CFA-13 Dry Well**

The CFA-13 dry well consisted of a dry well located south of the demolished locomotive repair shop Building CFA-640. The site was excavated during the WAG 4 Miscellaneous Sites 1997 NTCRA, and it was determined that the dry well was sewer clean-out for the demolished Building CFA-640. Excavation was performed to remove the sewer clean-out area and approximately 9 m (30 ft) of the associated piping.

Post-removal data from the 1997 removal action were used to characterize the residual nature and extent of contamination at the site. These data indicate that residual contamination exist in subsurface soils from 0.9 m to 6.1 m (3 to 20 ft) bgs at CFA-13. Polycyclic aromatic hydrocarbons, PCBs, lead, and radionuclides were identified as COPCs in the contaminant screen.

The potential exposure route and associated COC that produce estimated excess cancer risks greater than  $1\text{E-}04$  is external radiation exposure to Ra-226 by future residents. Ra-226 is a naturally occurring radionuclide in the U-238 decay chain. It is typically found in all soils at the INEEL at a nominal concentration of 1 pCi/g. The laboratory results will typically report concentrations at approximately 2 pCi/g (Giles 1998). The risk-based concentration for Ra-226 is 0.52 pCi/g, consequently even at background concentrations, Ra-226 will appear to present an unacceptable risk. Concentrations at CFA-13 are at background levels when corrected for instrument detection. In addition, Ra-226 was not disposed to the drywell and therefore should be considered to be a naturally occurring radionuclide.

PCBs have been detected at a maximum concentration of 10 mg/kg at a depth of 1 m (3 ft) bgs. This concentration produced a calculated hazard index equal to  $2\text{E}+00$  due to the combination of the soil ingestion ( $\text{HQ}=1\text{E}+00$ ) and the homegrown produce ingestion ( $\text{HQ}=8\text{E-}01$ ) exposure routes. The sample that produced the 10 mg/kg PCB detection was collected from the inside of the buried pipe at CFA-13. The pipe was cut approximately 30 ft from the CFA-13 drywell, and the pipe and the drywell were removed after the sample was collected. Visual inspection of the soil beneath the pipe showed no signs of contamination indicating that the PCB contamination is no longer present at CFA-13. There is no other source of PCB contamination within the site boundaries.

The ecological concern at CFA-13 is the risk to receptors from exposure to lead and mercury.

#### **8.4.2 OU 4-02: CFA-15 Dry Well**

The CFA-15 dry well was located northwest of Building CFA-674. An investigation identified a floor drain inside building CFA-674 with piping connected to the dry well; the dry well may have received laboratory liquid waste and solid calcined waste. CFA-15 was excavated during the 1997 WAG 4 Miscellaneous Sites 1997 Non-Time Critical Removal Action during November 1997. Soil was excavated to a depth of 2.4 m (8 ft). Piping that was connected to the dry well and the west wall of Building CFA-674 was cut and dry-packed with grout.

Post-removal data from the 1997 removal action was used to characterize the residual nature and extent of contamination at CFA-15. These data indicate that subsurface soils from 0.61 to 4.9 m (2 to 16 ft) bgs at CFA-15 contain residual levels of Ra-226 above contaminant screening levels.

The potential exposure route and associated COC that produce estimated excess cancer risks greater than 1E-04 is external radiation exposure to Ra-226 by future residents. Ra-226 is a naturally occurring radionuclide in the U-238 decay chain. It is typically found in all soils at the INEEL at a nominal concentration of 1 pCi/g. The laboratory results will typically report concentrations at approximately 2 pCi/g (Giles 1998). The risk-based concentration for Ra-226 is 0.52 pCi/g, consequently even at background concentrations, Ra-226 will appear to present an unacceptable risk. Concentrations at CFA-15 are at background levels when corrected for instrument detection. In addition, Ra-226 was not disposed to the drywell and therefore should be considered to be a naturally occurring radionuclide. No contaminants have been detected at CFA-15 that result in an estimated HQ greater than 1.0.

#### **8.4.3 OU 4-04: CFA-41 Excess Drum Storage (south of CFA-674)**

The ecological concern at CFA-41 is the risk to receptors from exposure to TPH.

#### **8.4.4 OU 4-05: CFA-04 Pond**

CFA-04 consists of a shallow pond located southeast of the termination of Nevada Street which was formerly used for the disposal of wastes from operations at the CFA-674 CEL. The CEL operated from 1953 until 1965 to conduct pilot studies of a nuclear waste calcining process on simulated (no fuel) nuclear fuel rods. There are no current discharges from the building to the pond.

Data from the 1994, 1995, 1997, and 1998 sampling activities were used to characterize the contamination nature and extent of contamination at CFA-04. These data indicate that surface and subsurface soils [0 to 2.4 m (0 to 8 ft) bgs] at CFA-04 are contaminated with mercury. Also, soil in the pond bottom and the windblown area is hazardous for mercury under RCRA.

The potential exposure route and the associated COC that produce estimated hazard quotients greater than EPA permissible levels is ingestion of mercury in homegrown produce by future residents. This exposure route is associated with an estimated hazard index of 62. No contaminants have been detected at CFA-04 that result in an estimated excess cancer risk greater than 1E-04.

The ecological concern at CFA-04 is the risk to receptors from exposure to a mercury.

#### **8.4.5 OU 4-06: CFA-43 Lead Storage Area**

The ecological concern at CFA-43 is the risk to receptors from exposure to lead with HQ values as high as 300. The human health risks at the site are below the criteria. These site data and results will be submitted for the WAG 10 OU 10-04 ERA.

#### **8.4.6 OU 4-07: CFA-12 French Drain (south drain)**

This site consists of two french drains (commonly referred to as the north and south french drains) located east of the north corner of Building CFA-690, which housed several laboratories and offices operated by the DOE RESL. The french drains were unlined concrete cylinders approximately 0.6 m (2 ft) in diameter which extended to 1.8 m (6 ft) bgs.

A removal action was performed at CFA-12 in July 1995, concurrent with the OU 4-09 Track 2 investigation. Soil was removed to a depth of approximately 2.4 m (8.5 ft); therefore soils from the surface to the basalt at CFA-12 are considered clean. The north french drain was screened from further evaluation following the Track 2 investigation. Several radionuclides detected in the subsurface soil at 2.6 m (8.5 ft) bgs were slightly above background concentrations and are present in a subsurface basalt fracture located northeast of the south french drain.

The exposure route and the associated COC that produce estimated risks greater than  $1E-04$  is external radiation exposure to Cs-137 to future residents. Cs-137 was detected in a fracture of the basalt bedrock at a depth of 2.6 m (8.5 ft) and is considered inaccessible to a future residential receptor. It is assumed in the BRA that a resident would excavate to a depth 3.2 m (10 ft) and bring potentially contaminated soil to the surface where exposure would occur. The primary exposure pathway at this site however is not complete due to the fact that all contaminated soil was removed from the site and remaining contamination is present only in a fracture of the basalt, which is inaccessible to the resident. No contaminants have been detected at CFA-12 that result in an estimated HQ greater than 1.0. As a result, no further human health evaluation for CFA-12 will be performed in the WAG 4 FS.

The ecological concern at CFA-12 is the risk to receptors from exposure to pentachlorophenol. This contaminant was not quantitatively assessed because there is no TRV.

#### **8.4.7 OU 4-08: CFA-08 Drainfield**

The CFA-08 drainfield is located approximately 450 m (1,476 ft) northeast of the CFA-08 sewage plant and was operated from 1944 to 1995. The CFA-08 sewage treatment plant was used to treat CFA process wastewaters from 1953 to 1995. The drainfield has received treated effluent from the sewage treatment plant from 1944 to 1995.

Analytical data from the 1994 and 1997 sampling activities were used to characterize the contamination nature and extent at CFA-08. Measured concentrations indicate that surface and subsurface soils from 0 to 2.4 m (0 to 8 ft) bgs at CFA-08 are contaminated with radionuclides.

The potential exposure routes and the associated COCs that produce estimated risks greater than  $1E-04$  include external radiation exposure to Cs-137 to current and future occupation workers, and to future residents. No contaminants have been detected at the CFA-08 drainfield that result in an estimated HI greater than 1.0. Detections of Cs-137 occur from ground surface to 2.4 m (8 ft) bgs. Concentrations of Cs-137 are highest in the top 0.9 m (3 ft) of soil.

The ecological concern at CFA-08 is the risk to receptors from exposure to mercury, silver, and chloromethane. Chloromethane was detected at only 0.005 m/kg in subsurface soils and was not quantitatively assessed because there is no TRV. Chloromethane is a naturally occurring substance from biomass digestion, and is common in background air samples. Up to 50 ppm chloromethane in air are allowed by OSHA. Therefore, no further evaluation of this constituent will be performed as part of the WAG 4 FS.

The maximum mercury concentration found at the site is only slightly above 10X background (0.51 mg/kg versus 0.5 mg/kg), but the calculated 95% UCL of 0.3 mg/kg is well below the 10X background criteria. No background criteria exists for silver. Only small amounts were detected; out of 53 data points only 4 sample results were above 10 mg/kg, with the highest at 24 mg/kg.

Any remedial action for Cs-137 would also eliminate the risks associated with mercury and silver at this site. Hence, those constituents will not be evaluated further in the WAG 4 FS.

#### **8.4.8 OU 4-09: CFA-10 Transformer Yard Oil Spills**

CFA-10 is the site of possible PCB spills from storage of electrical transformers and of solvent and metal wastes disposed to the ground from welding shop operations.

No contaminants have been detected at CFA-10 that result in estimated risks greater than  $1\text{E-}04$  or estimated HIs greater than 1.0, but lead has been detected in surface soil at concentrations that exceed the EPA 400 mg/kg lead screening for residential soil and the occupational risks for dermal absorption exceed  $1\text{E-}06$ .

Measured concentrations indicate lead contamination is restricted to surface soils from 0 to 0.15 m (0–0.5 ft) bgs. Analytical data results for lead at CFA-10 are available for eight sampling locations; concentrations at five of these locations exceed the 400 mg/kg screening level. In addition, sample results at two locations are hazardous for lead under RCRA in one sample of four detected samples. The maximum copper concentration of 259 mg/kg is only slightly above the 10X background criteria of 220 mg/kg. The contamination at CFA-10 exists in the surface soil and any remedial actions for lead contamination will remediate the copper as well. Therefore, copper will not be evaluated further as a COPC in the WAG 4 FS.

The ecological concern at CFA-10 is the risk to receptors from exposure to copper and lead.

#### **8.4.9 OU 4-11: CFA-05 Motor Pool Pond**

The human health risk assessment produced no excess cancer risks or hazard indices greater than 1. The ecological concern at CFA-05 is the risk to receptors from exposure to cadmium, copper, lead, and 4-methyl-2-pentanone. There is no TRV for 2-methyl-2-pentanone, therefore this contaminant was not quantitatively assessed.

#### **8.4.10 OU 4-12: CFA-02 Landfill II**

The ecological concern at CFA-02 is the risk to receptors from exposure to lead and 4-methyl-2-pentanone, 2-methylnaphthalene, acetone, dibenzofuran and pentachlorophenol. There are not TRVs for 4-methyl-2-pentanone, 2-methylnaphthalene, dibenzofuran and pentachlorophenol, therefore these contaminants were not quantitatively assessed.

The cumulative assessment of the groundwater exposure pathway at WAG 4 indicates that potential excess cancer risks do not exceed the EPA permissible risk levels for the occupational and residential exposure scenarios. This assessment was made using site-specific soil contamination data, groundwater data, subsurface data from well logs, and GWSCREEN modeling. The limitation of these data, especially groundwater and subsurface data, from well logs is discussed in Sections 4 and 6.

Subsurface data from well drilling logs was used to determine overall interbed thickness in the vadose zone. The assumed continuity of the interbeds, used in the GWSCREEN model, is based on these data, which are limited.

Groundwater data was collected infrequently from monitoring wells upgradient from CFA since the 1950's. However, the primary focus of past monitoring programs has been contaminants from INTEC

and other upgradient sources. While several monitoring wells were added downgradient of the CFA Landfills in 1995, these wells are not downgradient of most of the WAG 4 potential release sites. Three additional monitoring wells, drilled in 1996, are downgradient WAG 4, however monitoring data is limited. These site data and results will be submitted for WAG 10 OU 10-04 ERA.

#### **8.4.11 OU 4-12: CFA-01 Landfill 1**

The CFA-01 BRA for human health produced no excess cancer risks for HIs greater than 1. The ecological risk assessment found chrysene and silver above 10X background with an HQ of 10 greater. The data and results will be submitted for further evaluation in the WAG 10 OU 10-04 ERA.

#### **8.4.12 Summary**

Table 8-6 contains the summary of WAG 4 sites with elevated risk levels to human health and ecological receptors, and the disposition of those sites for further evaluation.

Potential human health risks from past releases at WAG 4 are primarily associated with radiological contamination at CFA-08 Drainfield, and metal contamination at the CFA-04 Pond and CFA-10 Yard. CFA-04 and -10 also show elevated risks to ecological receptors. These sites will be submitted for evaluation in the WAG 4 FS.

Six other sites evaluated for the WAG 4 BRA produce unacceptable risks for ecological receptors. Those sites are CFA-01, -02, -05, -13, -41, and -43. The BRA data and results for these sites will be submitted for further evaluation in the WAG 10 OU 10-04 ERA in the RI/FS.